Geosciences Node

Ray Arvidson

MC Face-to-Face Meeting
Flagstaff, AZ
August 22-23, 2011

Overview

- Key Mission Work
- Individual Data Providers and Restorations
- Online Services
  - Analyst's Notebooks
  - Orbital Data Explorers
- Customer Interactions
- Geosciences Node Users
- NSSDC Delivery Status
- Node Advisory Committee Meeting

Key Mission Work

- Lead Node for Odyssey, MER, MRO, LRO, MSL, GRAIL
- Continuing regular releases of Odyssey, MER, MRO, and LRO, a total of 67 data sets, about 14 terabytes every 3 months

Key Mission Work – MSL

- Mars Science Laboratory rover launches this November, arrives August 6, 2012.
- Archive development has lagged behind schedule, but now that spacecraft is at the Cape, we should get more attention paid to archiving.
- Malin Space Science Systems (3 instruments) is participating in DAWGs, but still has not agreed to a schedule.
- OPGS (MIPL) is producing all instruments' EDRs for archiving, except those for the MSSS cameras. Teams will produce RDRs.

Key Mission Work - GRAIL

- GRAIL (twin lunar orbiters) launches in September 2011, acquires data March 8 – May 29, 2012.
- Archive development lagged behind schedule due to very small and overworked team.
  - Planned peer review of documents and sample data before launch will not happen.
  - Revised schedule based on peer reviews of actual data before deliveries in November 2012 and September 2013.
  - No more archiving work until after launch.

Individual Data Providers and Restorations

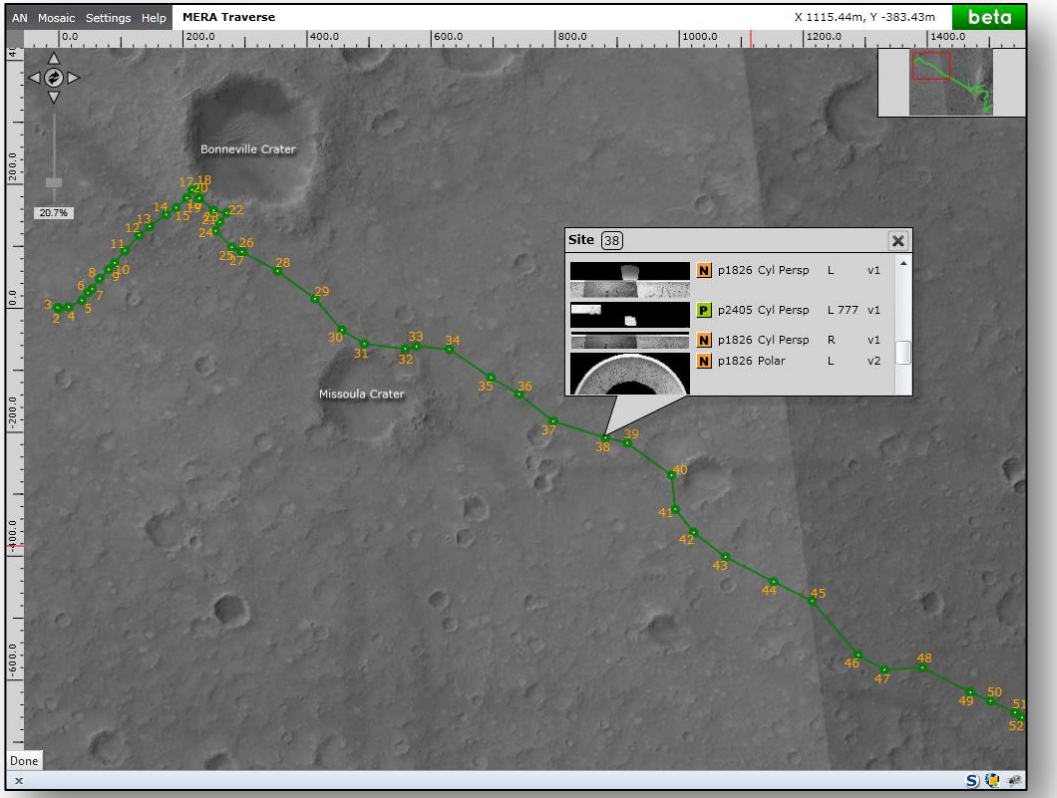
- S-band lunar radar data set from Bruce Campbell (Smithsonian Institution) just released.
- Lunar Prospector Elemental Abundance archive (Tom Prettyman, LANL) now in lien resolution.
- Lunar gravity archive from Frank Lemoine (GSFC) in preparation.
- Lunar radar altimetry archive from Michael Busch (UCLA) in preparation.
- Mars-analog spectral library data sets from Janice Bishop (SETI) and from Tatyana Brusentsova (Univ. Central Florida) in preparation.
- BUG Laboratory Apollo 11 lunar soil photometric measurements from Michael Shepard (Bloomsburg Univ.) in preparation.
- Magellan raw radio science data in preparation, with Dick Simpson.

Online Services – Analyst's Notebooks

- Analyst's Notebooks are in use for surface missions MER, Phoenix, Apollo, and LCROSS at http://an.rsl.wustl.edu/
- New capabilities for MER AN:
  - Interactive traverse map
  - Mosaic viewer
  - Additional features
    - Incorporate information from SAP and Maestro target databases
    - Improve data download and search functions
    - Provide additional data transformation options
      - Currently, Notebook only supports downloading image data in PDS or ENVI format
  - Virtual astronaut prototyping
- MSL Analyst's Notebook is planned based on MER
  - Team version updated daily
  - Public version coordinated with MSL data releases

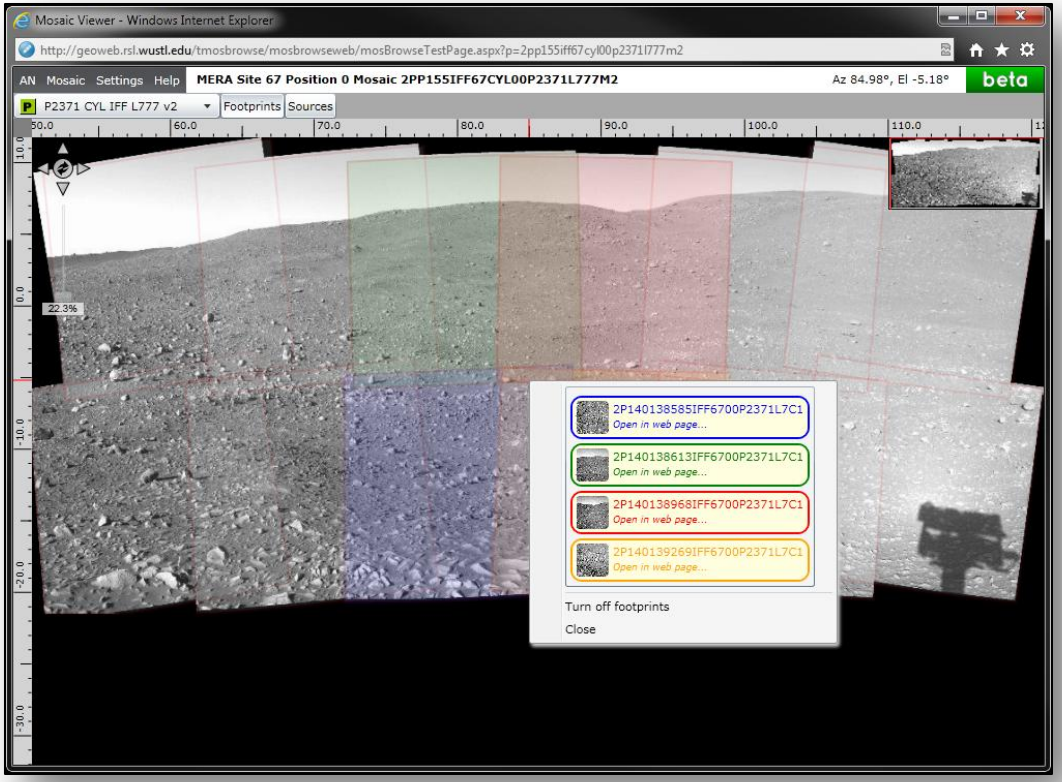
Interactive Traverse Maps

- Web interface for Mac's and PC's using Silverlight plug-in
- Uses corrected traverse registered to HiRISE map underlay (registration work by Ron Li's group at OSU)
- Dynamic zoom
- Links to mosaics and other data at each site
- Planned for both public and team Notebooks



Mosaic Viewer

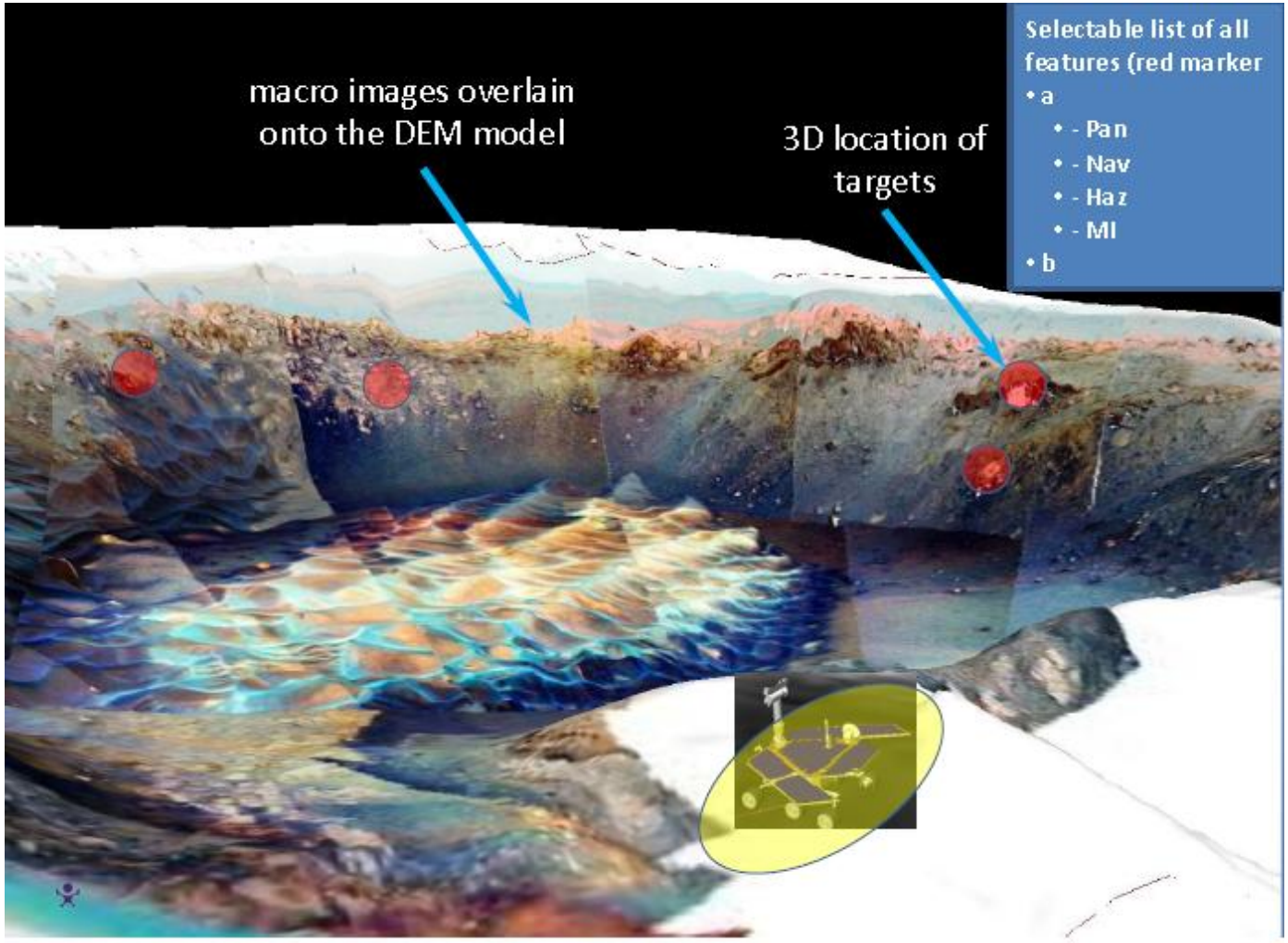
- Web interface for Mac's and PC's using Silverlight plug-in
- Contains released OPGS mosaics
- Dynamic zoom
- Overlay of source frame footprints
- Links to source data



Virtual Astronaut Prototyping

- Interactive 3D immersive environment using multiple sensor data for better contextual understanding
- Virtual astronaut will
  - Follow Spirit or Opportunity rover or "walk" around the virtual surface
  - Revisit the rover sites, viewing data and documents in context
  - Example: stop at location where rover collected a series of MI mosaics, or took APXS and MB measurements
- Case study within 400m by 400m area centered at Santa Maria Crater visited by Opportunity
- Long term goal use on web, desktop, and 3D immersive environment

Example Virtual Astronaut Scene

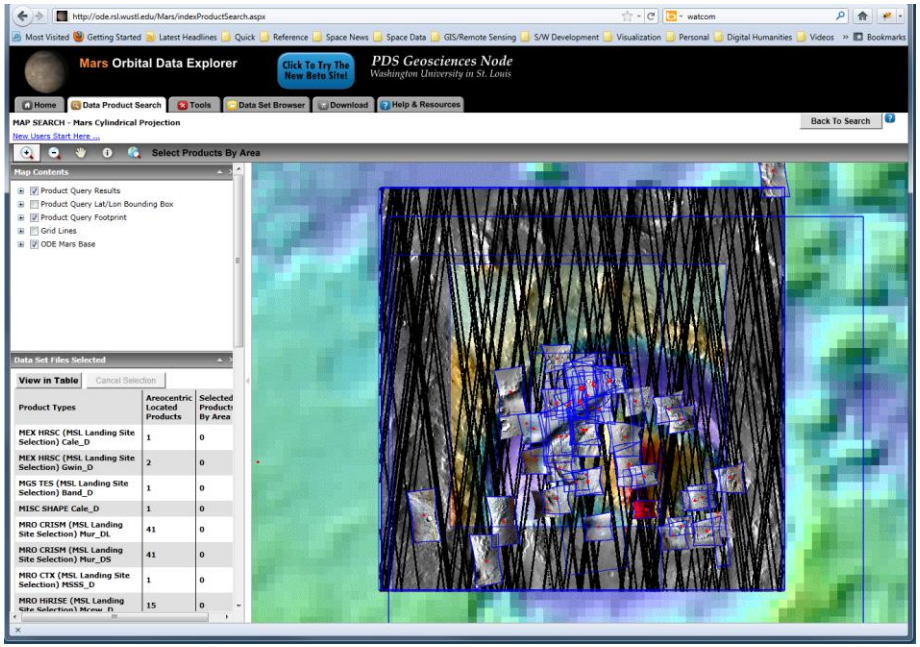


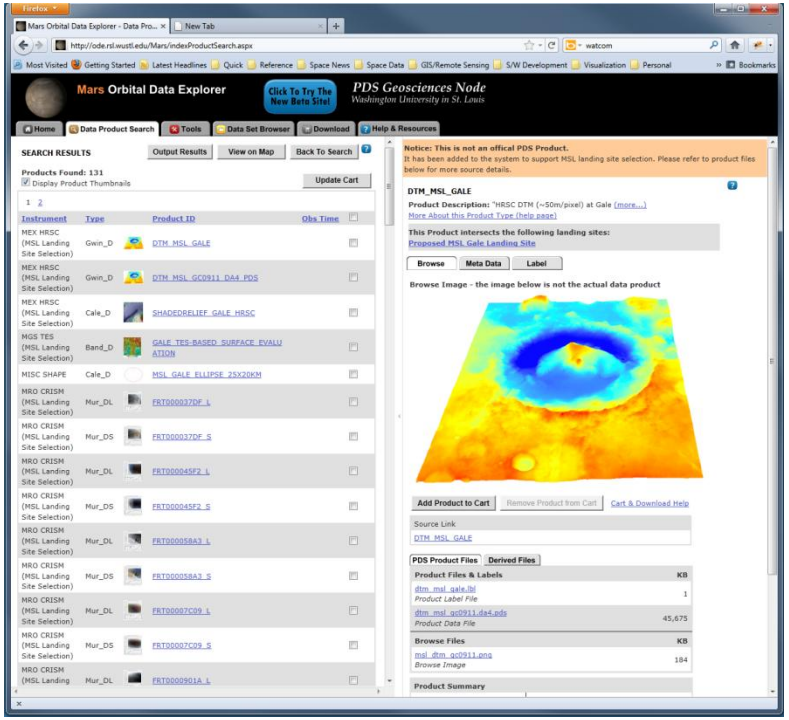
Online Services – Orbital Data Explorers

- ODE Mars
  - Mars Reconnaissance Orbiter (MRO) - CRISM, HiRISE, SHARAD, Gravity, MCS, and CTX
  - Mars Express - HRSC, OMEGA, PFS, MARSIS
  - Mars Global Surveyor - MOC, MOLA
- ODE Mercury
  - MESSENGER - GRS, MASCS, MDIS, MLA, NS, RSS, XRS
- ODE Lunar
  - LRO - LOLA, LAMP, LEND, LROC, Diviner, Mini-RF
  - ISRO's Chandrayaan-1 M3 instrument
  - Clementine, Lunar Prospector
- http://ode.rsl.wustl.edu/

Recent Improvements

MESSENGER / LRO / Chandrayaan-1 M3 support
MSL Landing Site selection support
Granular-level databases (LOLA, Diviner)
ODE Version 3.0 Beta publicly available (http://odestage.rsl.wustl.edu/)





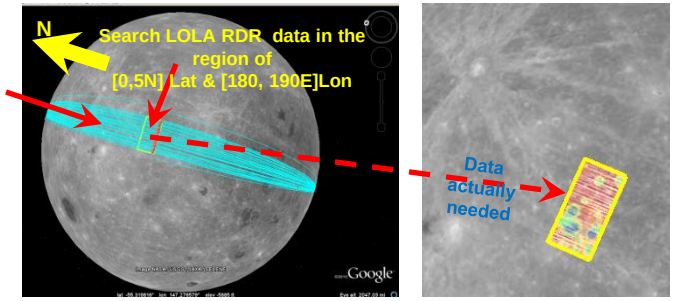
Granular-Level Databases
Record Level Access to Science Data Stored in PDS Data Products

- ODE provides several "Granular-Level" Databases and Query Tools:
- Stores individual data records from PDS data products in a searchable database
- Provides web-based query tools for generating "On-the-Fly" products of particular areas of interest

- Why Granular-Level Databases?

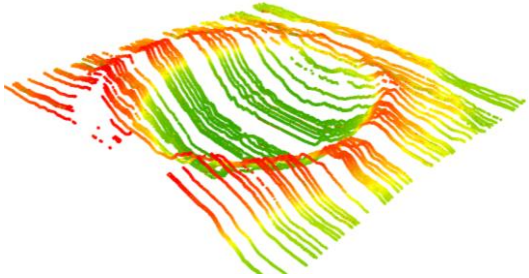
Some PDS data organized by orbit. Getting data for a particular region is difficult as one has to get many products, sort through each to select observations of interest, then organize those observations into a usable form.

Ex: a standard Lunar ODE query on the PDS metadata database returned 59 individual data products,
* each with about 0.2 million measurements,
* including many additional points outside of the search range,
* each file ~50MB.



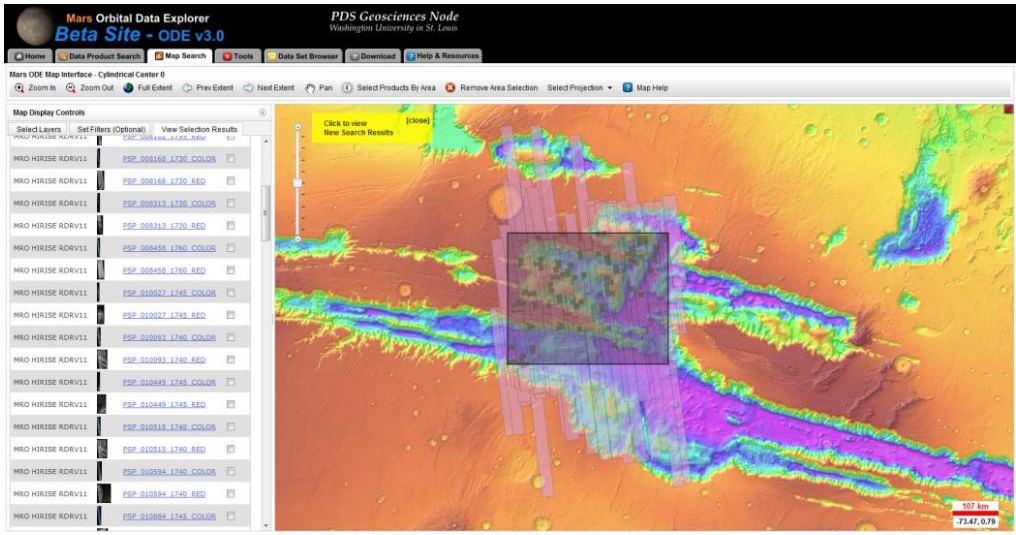
A LOLA RDRs specialized query of the observation database returned ~2.6 million measurements that matched the selected criteria.

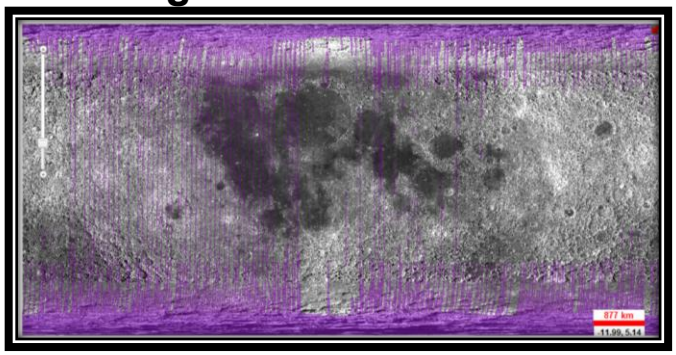
- Currently, ODE supports:
- MOLA PEDR, LOLA RDR, and Diviner RDR granule-level databases and query tools
- CSV (ASCII) tables, Shapefile, and Binned Image "On-the-Fly" products



ODE Version 3.0 Beta

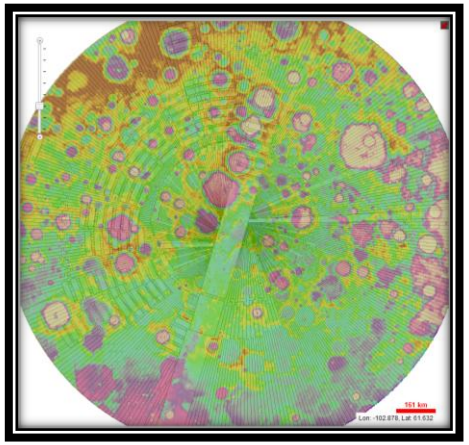
- http://odestage.rsl.wustl.edu/
- New map interface for data searching
  - Under “Map Search” tab
- Replaces “Search-by-Product-Center” with “Search-by-Product Coverage”





Example: Clementine HiRes footprints overlain on Lunar Reconnaissance Orbiter (LRO) Wide Angle Camera (WAC) mosaic

Example: LRO WAC image footprints overlain on LRO Lunar Orbiter Laser Altimeter (LOLA) topographic map in north polar stereographic projection



ODE Version 3.0 Beta

- http://odestage.rsl.wustl.edu/
- Beta went public on May 18, 2011
  - About 500 informal beta users from around the world since the start of the Beta test program
- General input has been very positive:
  - I really like the ability to choose the projection and the select by area tool – well done!
  - The interface is really intuitive and easy to use.
  - Great work! – In addition, this user gave several excellent suggestions on improving the interface, e.g, add individual footprint transparencies.
- ODE V3.0 release planned for Fall 2011

ODE Future Development

- Additional features
  - USGS Universal Product Coordinate (UPC) system link
  - Expanded query parameters (e.g., Image angles, Ls, time of day, etc.)
- Additional datasets
  - Additional MESSENGER datasets
  - Mars Odyssey THEMIS, GRS maps
  - Lunar Orbiter
  - Viking Orbiter
  - MGS TES
  - Magellan
- Product transform service
  - Convert PDS products to more user-friendly forms (Ex: .IMG -> GeoTIFF)

Customer Interactions: New Forums

- New Geosciences Node Forums for release announcements, data users, data providers, and Analyst's Notebook and ODE users. http://geoweb.rsl.wustl.edu/community/
  - Users must register to post a question or an answer. The forum is monitored.
  - Posted tutorials on creating color images from MER and Phoenix data, and using ENVI to open a PDS image.
  - All data set release announcements are posted on the forum.

Customer Interactions: Recent Examples

- Helped a user locate color images of LOLA roughness data that he had seen in a press release. The request inspired the LOLA team to include color-coded slope and roughness images in next release.
- Replied to a question about the total volume of data at the Geo Node and in PDS, for a talk to a GIS audience in which PDS was advertised as an example of good archive interoperability. (Alessandro Frigeri, Istituto di Fisica dello Spazio Interplanetario - INAF, Rome).
- Helped Steven Shope, Sandia Research, locate Apollo 17 Lunar Sounder Experiment data (not a PDS archive... yet).
- Helped a student use lunar topography data in ODE and ArcGIS.
- Helped a user download the entire Mars Express PFS data set from the Geosciences Node web page.
- Helped a user understand why two MER Pancam images appeared to have no range data (they are sun pictures).

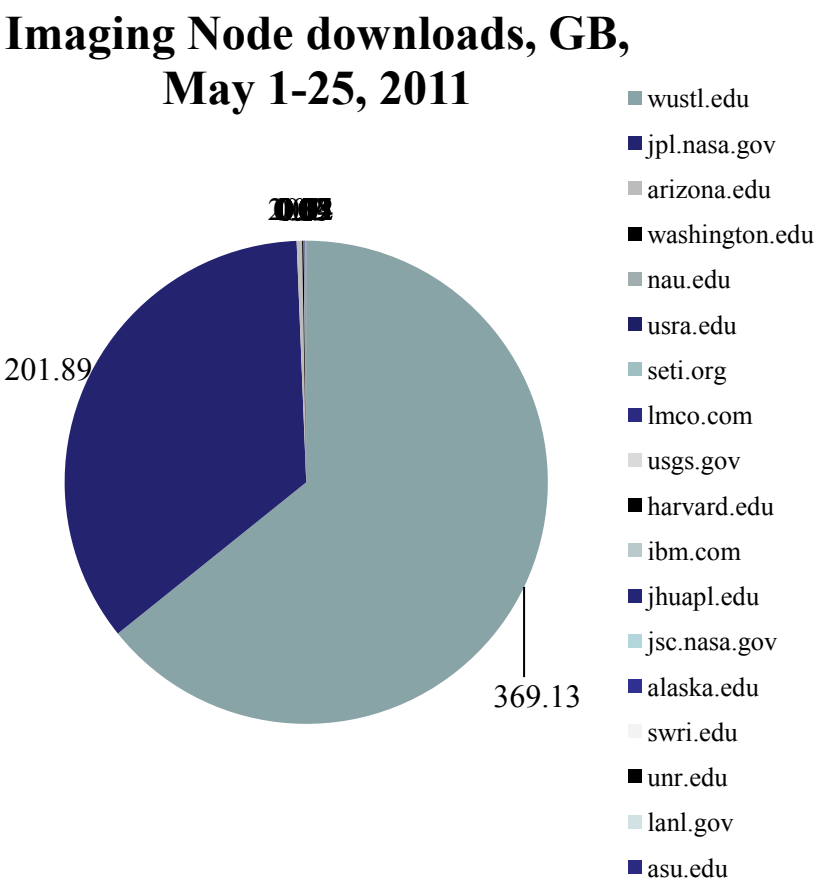
Geosciences Node Web and FTP Statistics*

	This quarter (May – Jul. 11)	Entire year to date (Jan. – Jul. 2011)
FTP files downloaded	2,933,196	5,689,850
FTP Gigabytes downloaded	5,871	12,893
Number of unique FTP users**	1,767	2,798
Website page views	1,586,721	3,008,896
Website Gigabytes downloaded	4,171	8,206

*FTP statistics include FTP downloads from Geosciences, SHARAD team, and Orbital Data Explorers (ODE). Web statistics include Geosciences, Analyst's Notebooks, Orbital Data Explorers, Geosciences Community Forum, and ODE Map Server websites.

**These values include # of unique FTP users using PDS Geo accesses only.

Geo is the Imaging Node's Biggest Customer*



Three ways that Imaging gets hits from Geo:

1. Geo downloads data for our own use, e.g. populating ODE databases and MER mosaics.
2. Geo downloads data for others, e.g. ODE shopping cart

For these two uses, between Jan. 1 2011 and May 1 2011 Geo was responsible for 36.8% of bandwidth use at Imaging, and 2.6% of page hits.

3. Geo directs users to Imaging, e.g. direct link on web page or user right-clicks and chooses "Save As".

Users directed from Geo to Imaging downloaded more data than from any other external source.

*** and that's the way it should be!**

NSSDC Delivery Status: Troubles with the Big Box

Expected configuration:

- NSSDC server IP address set to address supplied by Geo.
- NSSDC server has file share accessible by Geo Windows data server.
- Information provided to connect and mount share

This was not done!

Problems:

- Drive sleds not physically secured in case.
- Network ports not labeled.
- IP address not set as expected.
- Drives not mounted to server.
- File share not accessible.
- Contact person at NSSDC was not knowledgeable.
- Spent about 8 hours at Geo troubleshooting; system still not functioning.

Node Advisory Committee Meeting

- Geo Node Advisory Meeting held by telecon 8/9/11
- Advisors:
  - Jim Bell, University of Arizona
  - Larry Crumpler, New Mexico Museum of Natural History
  - Dick Morris, Johnson Space Center
  - Jeff Andrews-Hanna, Colorado School of Mines
- Recommendations:
  - Improve PDS/Geo visibility by making PDS credit info more obvious on web site, and include it with each email to users.
  - Continue work on AN interactive traverse map; it's cool
  - Make Virtual Astronaut more useful for science
  - Add additional data sets to ODE, e.g. Magellan
  - Spectral Library work is promising; see if we can include Roger Clark's spectral library